

This is an age of mini-fashions and biologists are nothing if not fashionable. The first chapter is on "Sex in Bacteria" by William Hayes and this is followed by "Sexual Reproduction in Protozoa" by G. H. Beale. From there we graduate to "Sex in Plants" by Kenneth Lewis and Bernard John, followed by "Sex Determination in Insects" by John Anderson. At last we are ready for "Sex Determination in Mammals" by R. A. Beatty, "The X Chromosomes and Gene Action in Mammals" by Mary Lyon and "The Sex-Ratio in Man" by A. S. Parkes. Now come four chapters on insects with varying connexions with sex: "The Chemical Basis of Courtship in the Insect World" by R. K. Callow, "Sound and Vision in the Sex Life of Insects" by H. Hurst, "The Rabbit Flea and Hormones" by Miriam Rothschild and "Control of Insects by Sexual Sterilization" by G. B. White. Then, after a chapter on "Sexual Behaviour in Mammals" by Paul Leyhausen, biology is left behind and we have "Sex in Psychoanalysis" by Irving Bieber, "Anthropology and the Sex Problem" by D. F. Pocock and "Sexual Deviation" by T. C. N. Gibbens.

To start at the beginning, Professor Hayes writes that "If we look for a common denominator of . . . sex . . . It is an alternating cycle in which two haploid parental cells . . . pool their genetic material in a single diploid cell or zygote; this zygote . . . subsequently segregates haploid progeny". True, but a common denominator is obviously less than the whole. Nevertheless, all the biological authors including the editor, who writes the introduction, seem to equate sex with sexual reproduction or basically the fusion of haploid nuclei followed by meiosis, the function of which is to provide new combinations of genes for natural selection to work on. Nobody seems to have thought it worth mentioning that, for instance, in man the volume of the egg cell is many thousand times that of the sperm. Not only is the large egg cell responsible for the complex development of the early embryo but the production of such diverse reproductive cells is associated with far-reaching physical and behavioural differences in the organisms which make them. Thus, sex is not just a mechanism to promote outbreeding, for which it is not necessarily very efficient and may indeed be downright useless, as pointed out by Professor Beale in connexion with autogamous protozoa. Self-fertilizing plants come into the same category. In its fully developed form, the sexual condition provides for the formation of highly complex organisms, which are themselves divided into two classes. It is surely the physical differences between males and females which provide the link between the biology of sex and its psychological and anthropological aspects. As it is, the different chapters are quite unconnected and, indeed, the word "sex" has entirely different meanings in different parts of the book.

Granted, then, that there is no unifying thread and that, moreover, the biology of sex has got rather a rough deal, the individual contributions are certainly worth reading. To mention only a few, the chapters on bacteria and protozoa are both models of clear exposition and, though their connexion with sex may be slight, this does not in any way detract from their interest. Nobody thinks any the less of prehistoric caves because they do not teach us much about architecture. "Sex Determination in Insects" is a useful summary of the classical cytogenetic facts of sex determination and also contains more recent work on experimental sex reversal. This chapter, however, is not always easy to follow, partly because the author uses such terms as "endomitosis" and "heterochromatization" without a word of explanation and also because of his attempt to explain the mode of action of sex chromosomes. This topic is still an unsolved problem and it would have been less painful to say so. The same problem crops up also in "Sex Determination in Mammals", which otherwise is a workmanlike account of the chromosomal and embryological bases of mammalian sex dimorphism. "The Sex-Ratio in Man" is a topic of great general

interest but one on which scientific data tend to be inadequate, and Professor Parkes is not afraid to say so. The subject of "The X Chromosomes and Gene Action in Mammals" would seem hardly ready for popular consumption but Dr Lyon has solved this problem by giving only one side of the story. The history of biology has many examples in which facts have eventually accommodated themselves to theory and time will show how far this will happen to the Lyon hypothesis.

One of the most absorbing stories in this book is squarely based on facts. It is about the rabbit flea whose life cycle is geared to the hormones of its host. It is a sordid story, co-ordinating rabbit blood and flea copulation. Here we have sex at its seamiest.

Given that its connexion with the biology of sex is rather weak, this Penguin Science Survey can be recommended as a miscellany of interesting topics in biology and allied subjects.

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MOLECULAR EMBRYOLOGY

Comprehensive Biochemistry

Vol. 28: Morphogenesis, Differentiation and Development. Edited by Marcel Florjkin and Elmer H. Stotz. Pp. xii+276. (Amsterdam, London and New York: Elsevier Publishing Company, 1967.) 90s.

THE contents of this book belie the title of the series to which it belongs. It is in no sense comprehensive, nor could it be at several times the length. Nevertheless it does offer useful reviews of six of the fields from which molecular embryology can expect its first great harvests.

Monroy reflects an important shift in the biochemical centre of interest in fertilization. Egg-sperm recognition and the mechanisms of contact and penetration are ignored. Oogenesis, and in particular the elaboration of the protein synthetic machinery that will be called into play shortly (in mammals) or more tardily (in many other animals) after cleavage has begun, gets pride of place. Activation and its sequelae are discussed primarily in terms of the controlled de-repression of transcription and translation of genetic information.

Brachet, before discussing nucleic acid synthesis in embryos, provides a succinct and lucid account of the relevant background problems emerging from classical experimental embryology. He, too, is concerned with egg structure, but carries its consequences forward into later embryonic life. He stresses the value of single gene mutants for the analysis of gene regulation during development. For this reason alone the living mammalian egg, now so much more accessible to study than ever before, is certainly about to come into its own.

Both amphibian metamorphosis and embryonic induction have a long history of biological, physiological and chemical analysis. As helpful reviews by Weber and Yamada show, progress in both still seems to be piecemeal, but it is hard to believe that recent and refined biochemical work will not soon be rewarded by a real breakthrough. Articles by Gilbert on the biochemical concomitants of insect metamorphosis and by Scarano and Augusti-Tocco on biochemical pathways in embryos may each usefully draw the biochemist's attention to materials that may be unfamiliar to him.

A year ago Joshua Lederberg asked whether developmental biology might not be cleaned up within the next decade, and suggested that one of the things we should do, if such a timetable appealed, was to concentrate efforts on fewer kinds of animal. He was probably right, and if this volume gives little encouragement for believing that the end is so near, there are signs of increasing preoccupation with the animals and processes that offer the best openings for biochemical attack. D. R. NEWTH